

Introduction to Automotive Electronics

Final Project

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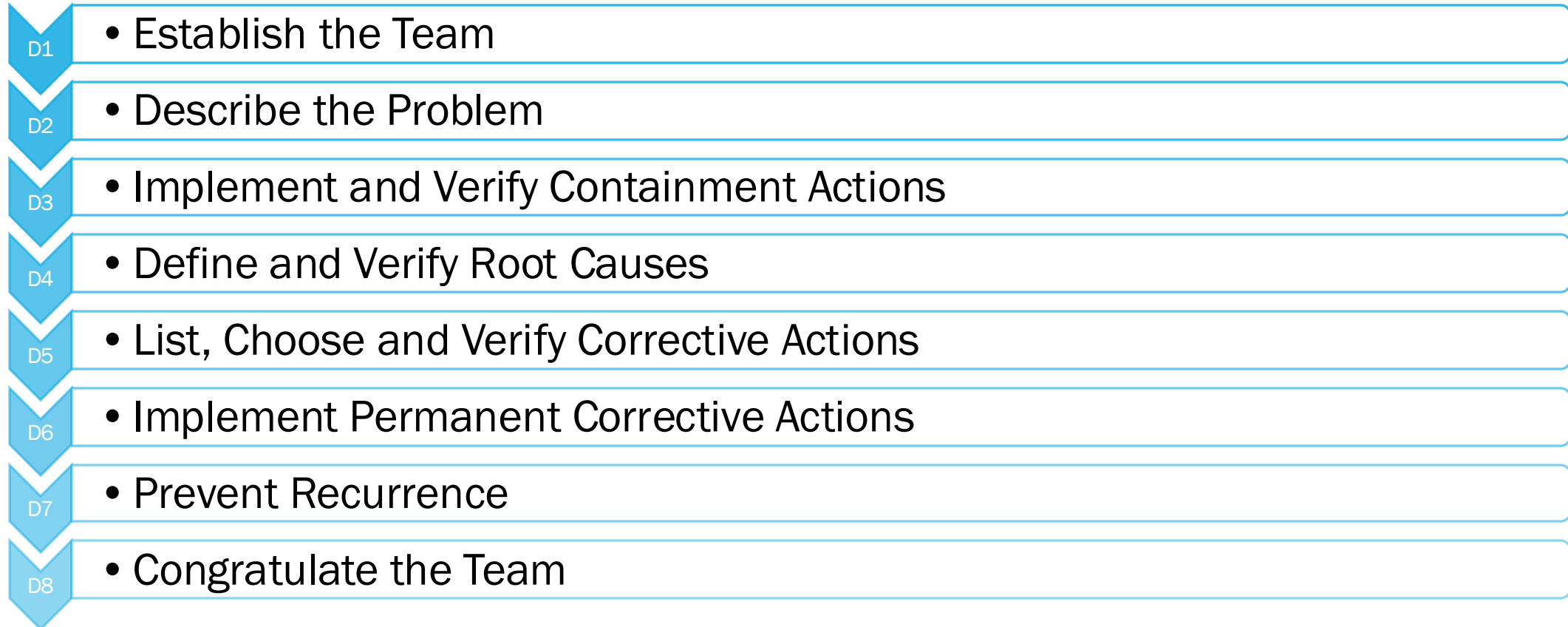
Topic

- 情境：自2022年以來，您公司的產品每月出貨量為10萬件，出貨品質保持在相當高的水準。
今年8/9 **Bravo客戶工廠**於組裝後進行特性檢驗時，發現了3件缺陷，且這3件缺陷模式相同。Bravo發了客訴郵件給您的公司，要求貴公司停止交付此缺陷批次，並交付等量的替換零件。
隨後，**一家汽車製造商（OEM）**生產的整車測試中又發現了2件缺陷。缺陷模式看來與客戶Bravo發現的3件相同，但根據交貨期推斷，該批次與Bravo發現批次不同的可能性更高。這是一個危急的情況。如果不採取對策，可能會出現巨大的問題，因此貴公司顯然需要立即採取行動來遏制和解決問題。
- 題目：請繪製出此客訴處理流程圖及撰寫一份完整的8D報告。注意供應鏈的關係、8個步驟的要點、邏輯性及可讀性。於情境的合理範圍內，可以任意模擬出想表達的人/事/物（e.g. 團隊成員、問題發生地點、解決方案...etc.）

Outline

- Brief introduction to the 8D process
- Detailed 8D process of the scenario
- Customer Complaint Handling Flowchart

Brief Introduction of the 8D Process



D1: Establish the Team

Main objective: Comprehensive investigation and resolution of the product defect impacting customer Bravo and the OEM automotive manufacturer.

Title	Name	Description
Quality Manager	Maria Huang (Team Leader)	Responsible for overall investigation and report coordination
Design Engineering Representative	Alex Chen	Technical analysis of potential design-related root causes
Manufacturing Process Engineer	Sarah Kim	Process and production investigation
Supply Chain Specialist	Emily Tan	Traceability and batch tracking
Test and Validation Engineer	David Lin	Defect verification and characterization
Customer Liaison	Kelly Wong	External communication and customer relationship management

D2: Describe the Problem

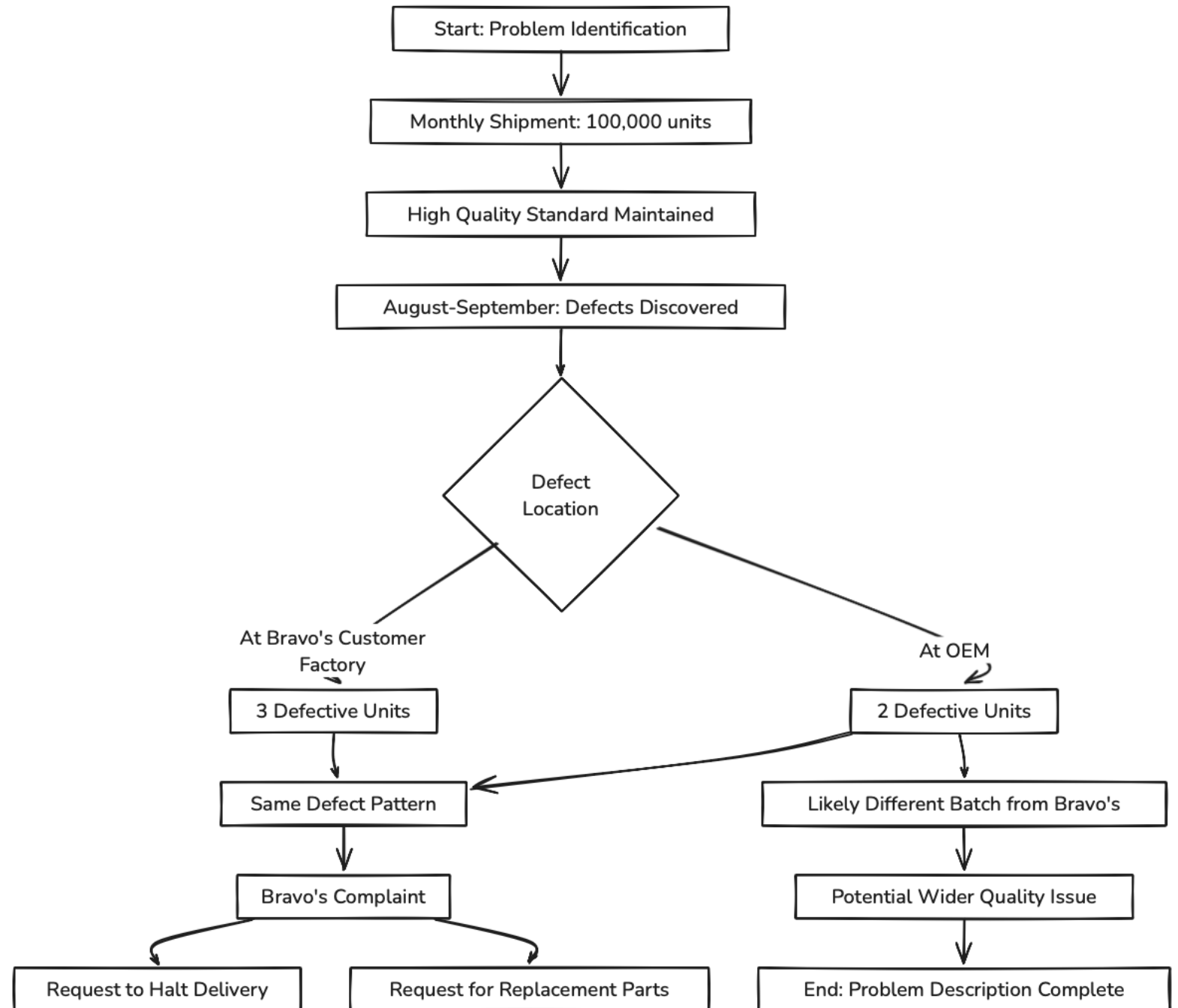
In August and September of this year, three defective units were discovered during characteristic inspections after assembly at Bravo's customer factory, all exhibiting the same defect pattern. Two additional defects were later found while testing complete vehicles produced by Totoya. The defect patterns are the same as the three identified before.

	Case 1	Case 2
Who found it	Bravo	Totoya
What problem	Unit name defect, same pattern	
What is the affected batch	#2208-A	#2209-B
Where did it happen	Bravo's factory	Totoya vehicle testing
When did it happen	Aug., Sep. 2024	later
How many	3 units	2 units

Should not include "Why" at D2!!

D2: Describe the Problem: Flowchart

In August and September of this year, three defective units were discovered during characteristic inspections after assembly at Bravo's customer factory, all exhibiting the same defect pattern. Two additional defects were later found while testing complete vehicles produced by Totoya. The defect patterns are the same as the three identified before.



D2: Describe the Problem: Lot Traceability Records

In August and September of this year, three defective units were discovered during characteristic inspections after assembly at Bravo's customer factory, all exhibiting the same defect pattern. Two additional defects were later found while testing complete vehicles produced by Toyota. The defect patterns are the same as the three identified before.

Defect Number	1	2	3	4	5
Data Code	DC-2208	DC-2208	DC-2208	DC-2209	DC-2209
Shipping Data from RTK	RTK-001-Aug	RTK-001-Aug	RTK-002-Sep	RTK-003-Sep	RTK-003-Sep
Shipping Data from Distributor	DIST-105-Sep	DIST-105-Sep	DIST-106-Sep	DIST-107-Oct	DIST-107-Oct
Wafer (Lot) Number	W1234 (WLN-22081)	W1234 (WLN-22081)	W2234 (WLN-22085)	W3346 (WLN-22082)	W3346 (WLN-22082)
Die Location (x, y)	(23,45)	(25,47)	(12,18)	(34,56)	(36,58)
Package Lot Number	PLN-082022-01	PLN-082022-01	PLN-092022-02	PLN-092022-03	PLN-092022-03
Lead Frame Strip No.	LFS-001	LFS-001	LFS-002	LFS-003	LFS-003
Lead Frame Strip Location (x, y)	(5,10)	(6,12)	(7,14)	(9,17)	(10,19)

D2: Describe the Problem:

Initial defect inspection reports

In August and September of this year, three defective units were discovered during characteristic inspections after assembly at Bravo's customer factory, all exhibiting the same defect pattern. Two additional defects were later found while testing complete vehicles produced by Totoya. The defect patterns are the same as the three identified before.

Inspection Parameter	Details
Defect Identification	Three defects identified by Bravo. Two additional defects were found during Totoya vehicle testing
Defect Pattern Description	Consistent defect pattern across all five defective units, observed as specific defect feature
Inspection Date	Bravo: August & September 2024 Totoya: September 2024
Batch/ Lot Number	Bravo: Lot #2208-A Totoya: Lot #2209-B
Inspection Methodology	Visual inspection, characteristic measurements, functional tests
Defect Rate	Bravo: 3/10,000 units in Lot #2208-A Totoya: 2/10,000 units in Lot #2209-B
Key Findings	Defects localized to specific coordinates within the die
	Similar defect patterns across all five samples
	No anomalies found in outgoing quality control (OQC) records

D3: Implement and Verify Containment Actions

- Immediate containment measures to isolate the problem from customers

Production Halt

- Immediate cessation of shipments for potentially affected lot numbers
- Quarantine of remaining inventory from suspect production batches

Customer Communication

- Notify Bravo and Totoya of immediate investigation
- Commit to providing replacement parts
- Establish daily status update protocol

Lot Traceability

- Comprehensive trace-back of affected production lots
- Identify precise manufacturing dates, shifts, and production line
- Segregate and isolate potentially impacted inventory

Risk Mitigation

- Initiate 100% inspection of remaining inventory from suspect production periods
- Prepare replacement parts for customer compensation

D3: Implement and Verify Containment Actions

Root Cause Hypothesis

- Potential supplier material defect in lead frame or die
- Manufacturing parameter drift during wafer assembly
- Transportation damage post-OQC

Containment Actions

- Stopped shipment of all remaining units from Lot #2208-A and Lot #2209-B
- Issued recall for defective batches
- Conducted additional inspections for all in-stock units and shipments

Next Steps

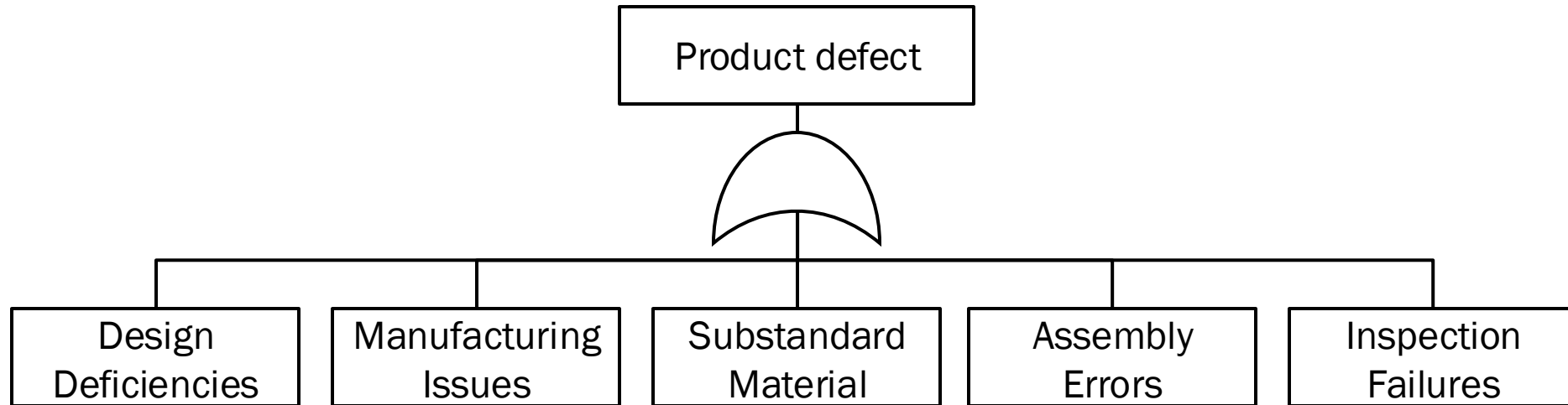
- Detailed root cause analysis
- Engage with suppliers to evaluate material quality
- Enhance testing coverage to detect potential defects earlier

D4: Define and Verify Root Causes

Root Cause Aspect		Root Cause Level	
NC (Non-conformance)	<ul style="list-style-type: none">Potential systematic issue in production or assemblyPotential inconsistent production or assemblyPotential substandard raw material	TRC (Technical root cause)	<ul style="list-style-type: none">Potential design parameter deviationManufacturing process variationComponent quality from specific supplier
		MRC (Managerial root cause)	<ul style="list-style-type: none">Lack of maintenance schedules or calibration standardsInadequate training or supervision of operators
ND (Non-detection)	<ul style="list-style-type: none">Potential weakness in current in-process quality controlInsufficient final test coverageInadequate statistical process control	TRC (Technical root cause)	<ul style="list-style-type: none">Test equipment calibration issues
		MRC (Managerial root cause)	<ul style="list-style-type: none">Weak supplier quality management processesPotential rushed inspections

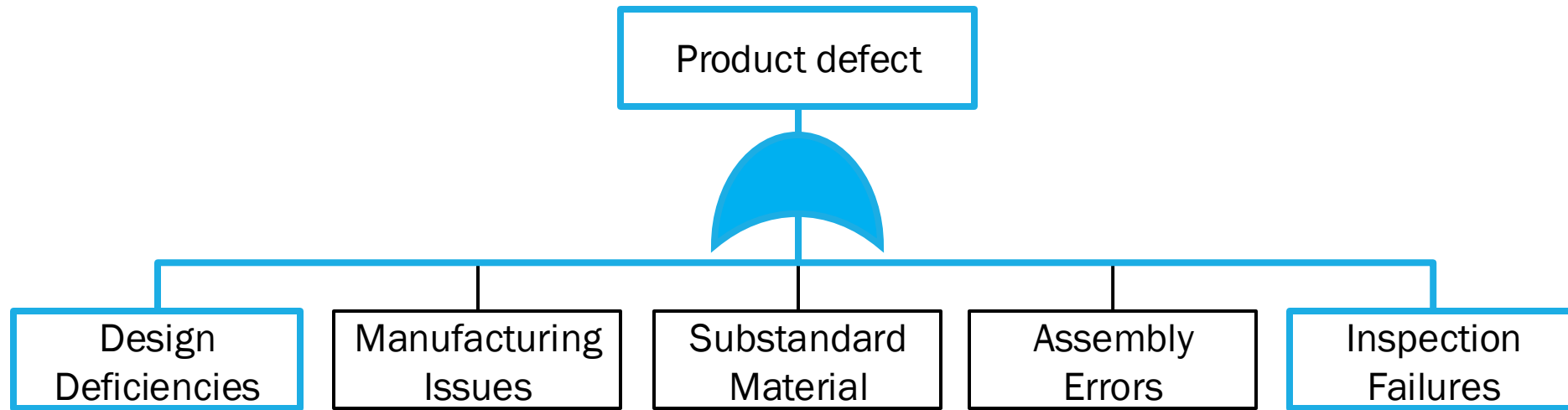
D4: Define and Verify Root Causes

- Use **Fault Tree Analysis** to analyze potential causes



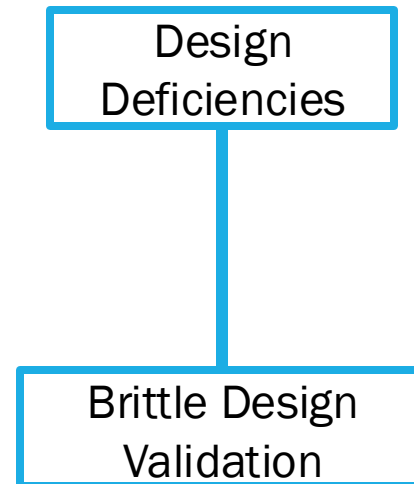
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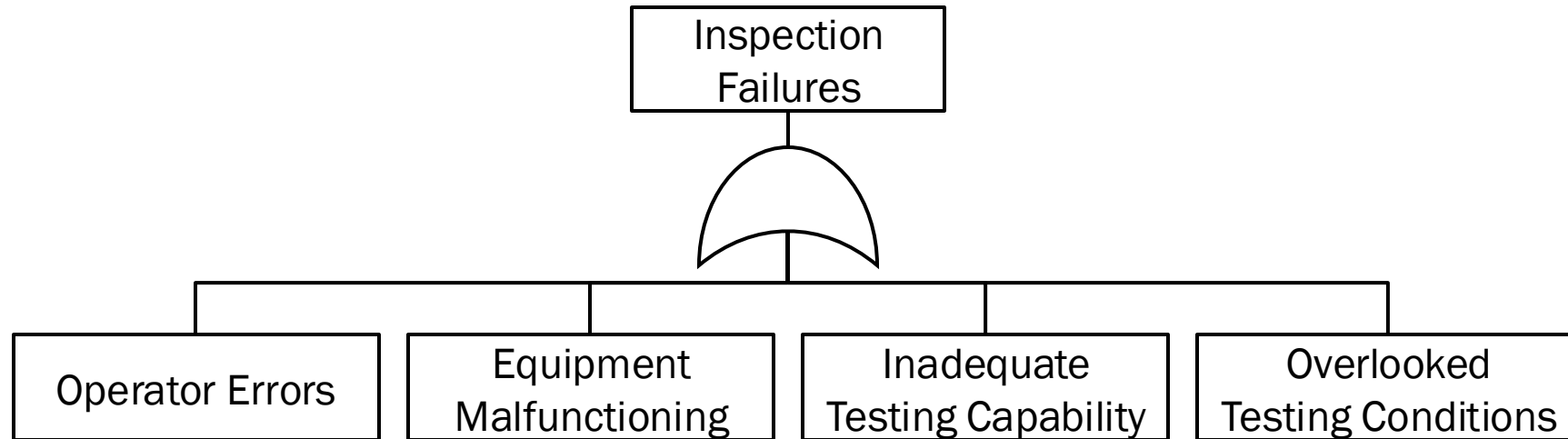
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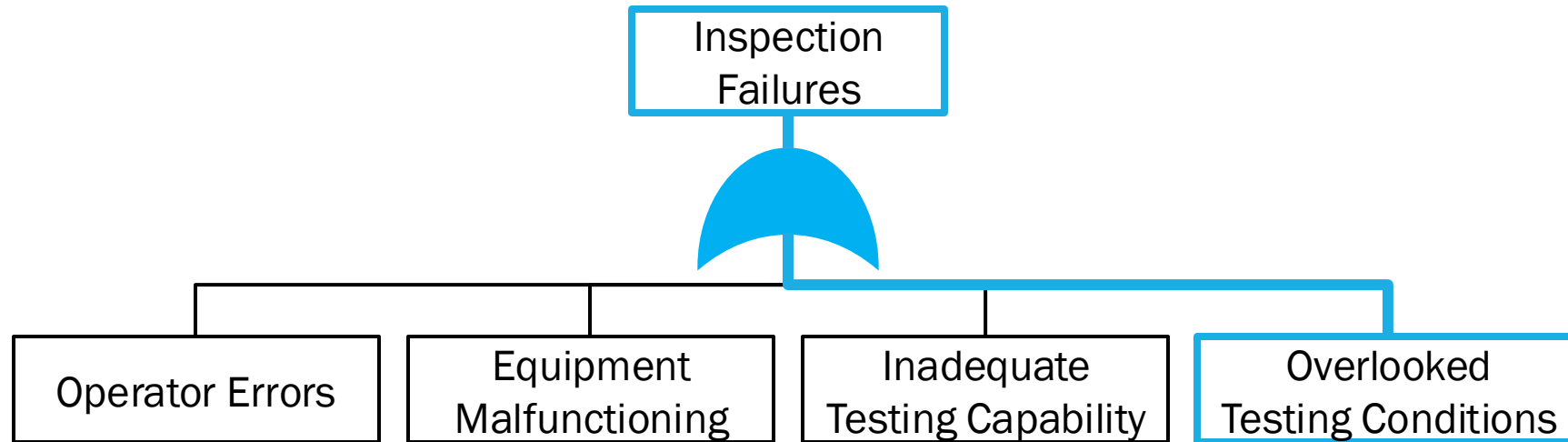
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- Use **Fault Tree Analysis** to analyze potential causes



D4: Define and Verify Root Causes

- Use **Fault Tree Analysis** to analyze potential causes



D5: List, Choose and Verify Corrective Actions

- List potential corrective actions

Design
Parameter Re-
validation

Design
Verification
Improvement

Supplier Quality
Improvement
Plan

Manufacturing
Process
Parameter
Adjustment

Quality Control
Process
Modification

Enhanced
Testing Protocol

D5: List, Choose and Verify Corrective Actions

- Choose potential corrective actions based on root causes

Design
Parameter Re-
validation

Design
Verification
Improvement

Supplier Quality
Improvement
Plan

Manufacturing
Process
Parameter
Adjustment

Quality Control
Process
Modification

Enhanced
Testing Protocol

D5: List, Choose and Verify Corrective Actions

Design Verification Improvement

- Expand design validation scope by including a broader range of real-world conditions.
- Perform iterative validations at different design stages.
- Develop a checklist of environmental conditions based on customer usage data with regular updates.

D5: List, Choose and Verify Corrective Actions

Enhanced Testing Protocol

- Ensure testing conditions match actual customer use cases and environmental factors.
- Review and update testing protocols regularly.
- Provide additional training to the testing staff.
- Engage third-party testing agencies.

D6: Implement Permanent Corrective Actions

- Implement permanent corrective actions based on D5 and verify their effectiveness.

Expand Design Validation Scope

Implementation

- Include a broader range of real-world conditions and simulate real-world scenarios.

Validation

- Conduct controlled tests in environmental chambers.
- Compare test results with baseline performance.

D6: Implement Permanent Corrective Actions

- Implement permanent corrective actions based on D5 and verify their effectiveness.

Perform Iterative Validations

Implementation

- Integrate validation checkpoints into the design timeline.
- Refine the design based on test results at each stage.

Validation

- Track design changes and corresponding validation results.

D6: Implement Permanent Corrective Actions

- Implement permanent corrective actions based on D5 and verify their effectiveness.

Develop Checklists of Environmental Conditions

Implementation

- Collaborate with design, QA, and customer support on the checklist.
- Update the checklist quarterly.

Validation

- Conduct a gap analysis to confirm all customer use cases are addressed.

D6: Implement Permanent Corrective Actions

- Implement permanent corrective actions based on D5 and verify their effectiveness.

Ensure Testing Conditions Integrity

Implementation

- Analyze customer feedback and field reports.
- Develop real-world simulation tests.

Validation

- Compare test results under simulated conditions to field failure reports.

D6: Implement Permanent Corrective Actions

- Implement permanent corrective actions based on D5 and verify their effectiveness.

Review and Update Testing Protocols

Implementation

- Establish a testing review committee to assess protocols quarterly.

Validation

- Review test coverage.

D6: Implement Permanent Corrective Actions

- Implement permanent corrective actions based on D5 and verify their effectiveness.

Provide Additional Training

Implementation

- Organize workshops and training sessions on updated testing methods.

Validation

- Evaluate testing staff through post-training assessments and audits.

D6: Implement Permanent Corrective Actions

- Implement permanent corrective actions based on D5 and verify their effectiveness.

Engage Third-Party Testing Agencies

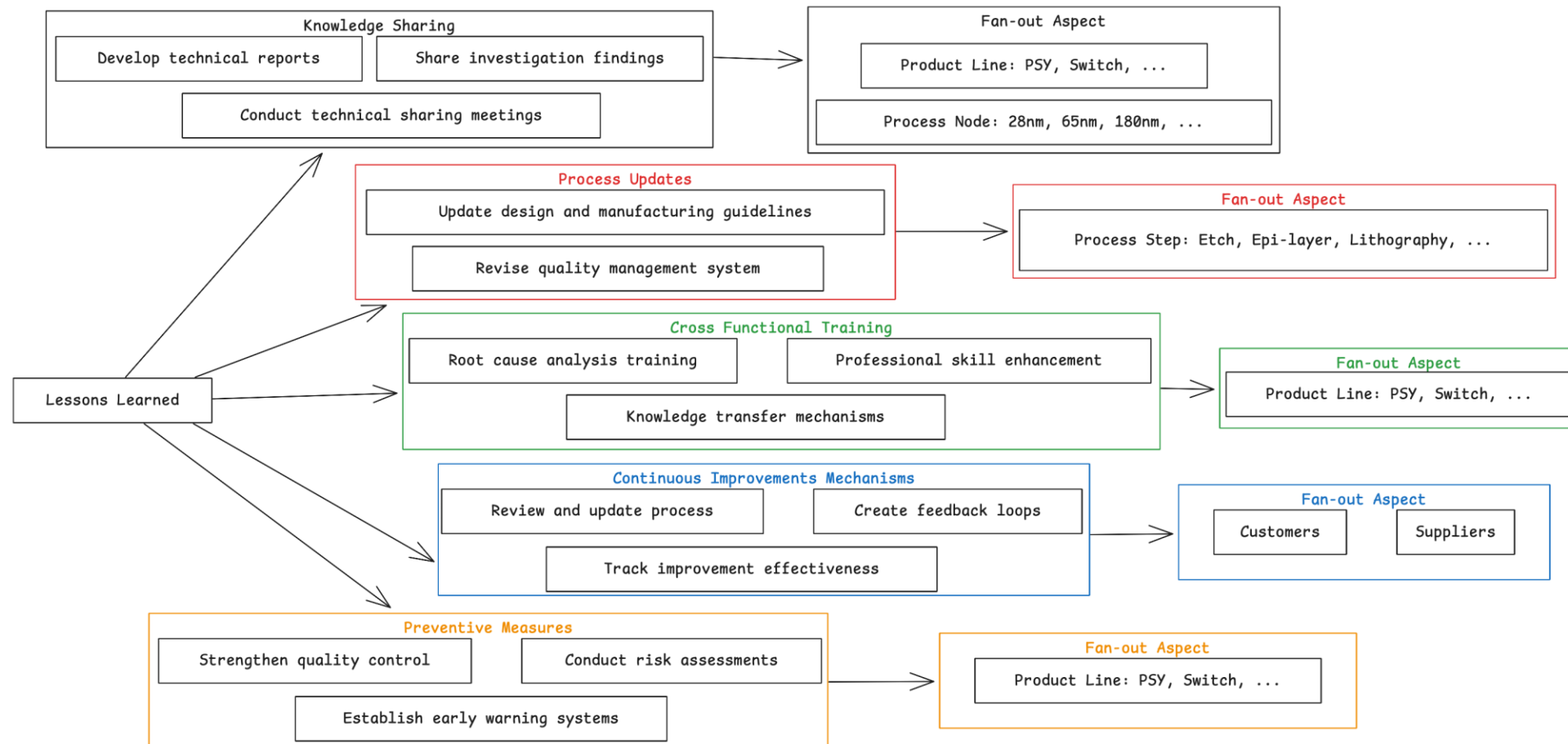
Implementation

- Partner with a certified testing agency.

Validation

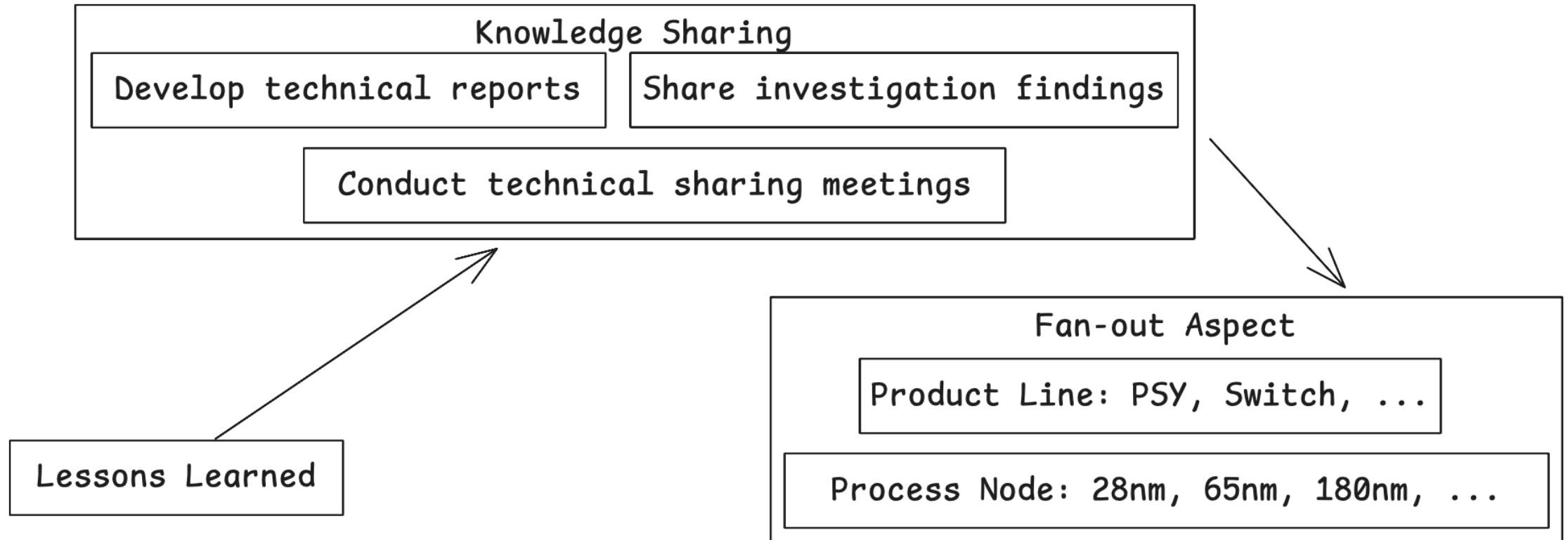
- Compare third-party test results with internal testing.

D7: Prevent Recurrence



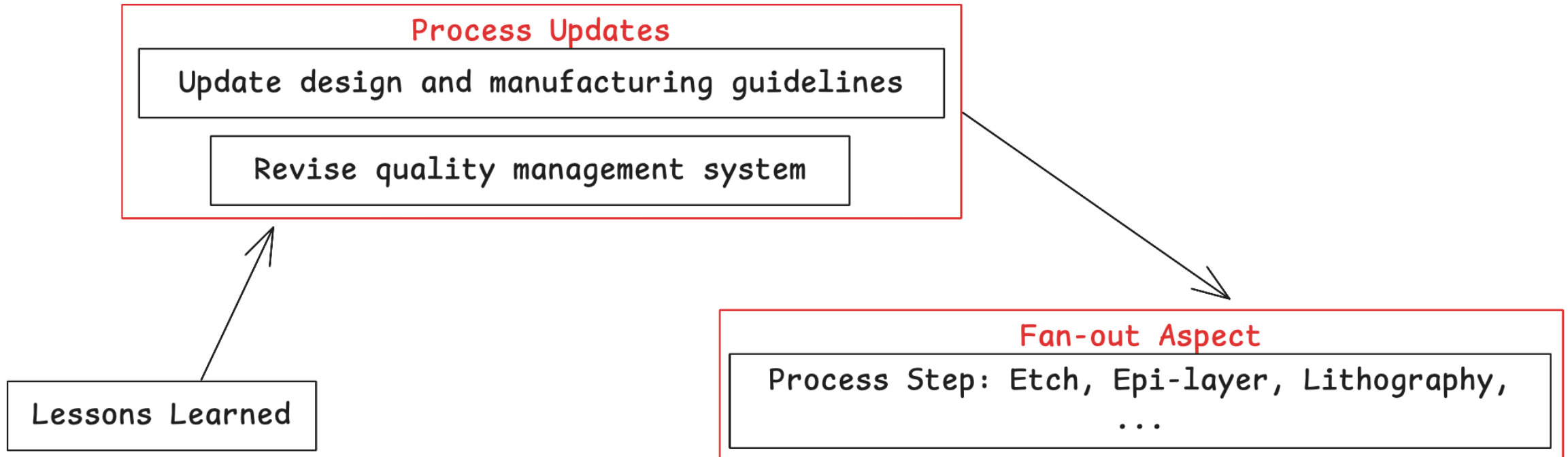
D7: Prevent Recurrence

1. Knowledge Sharing



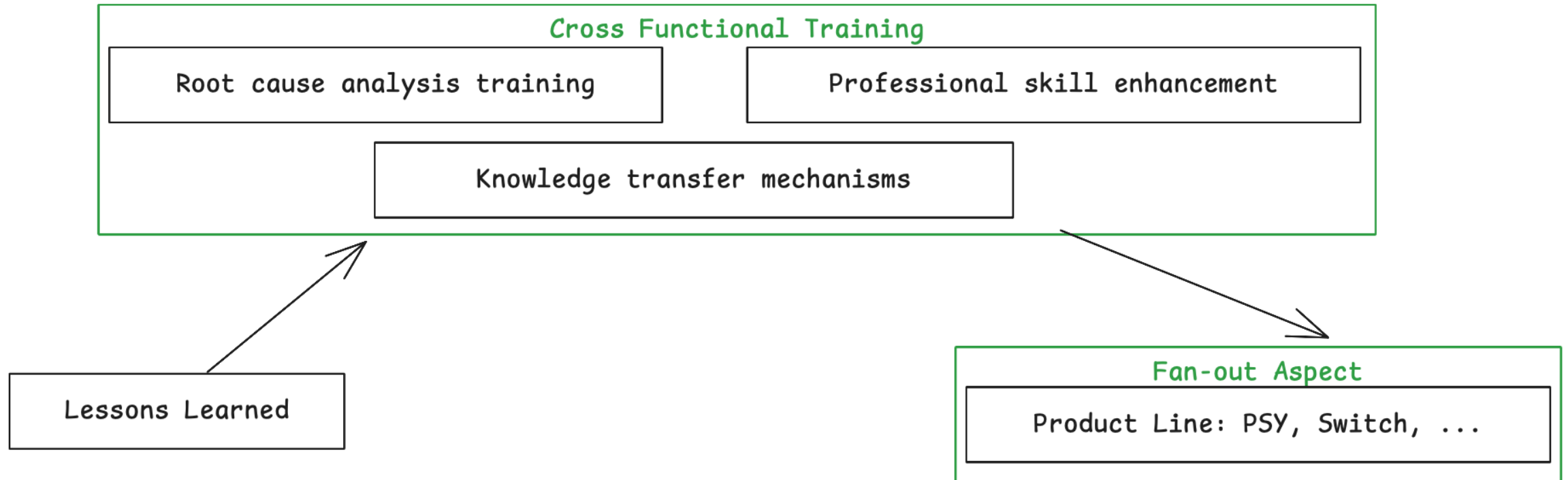
D7: Prevent Recurrence

2. Process Updates



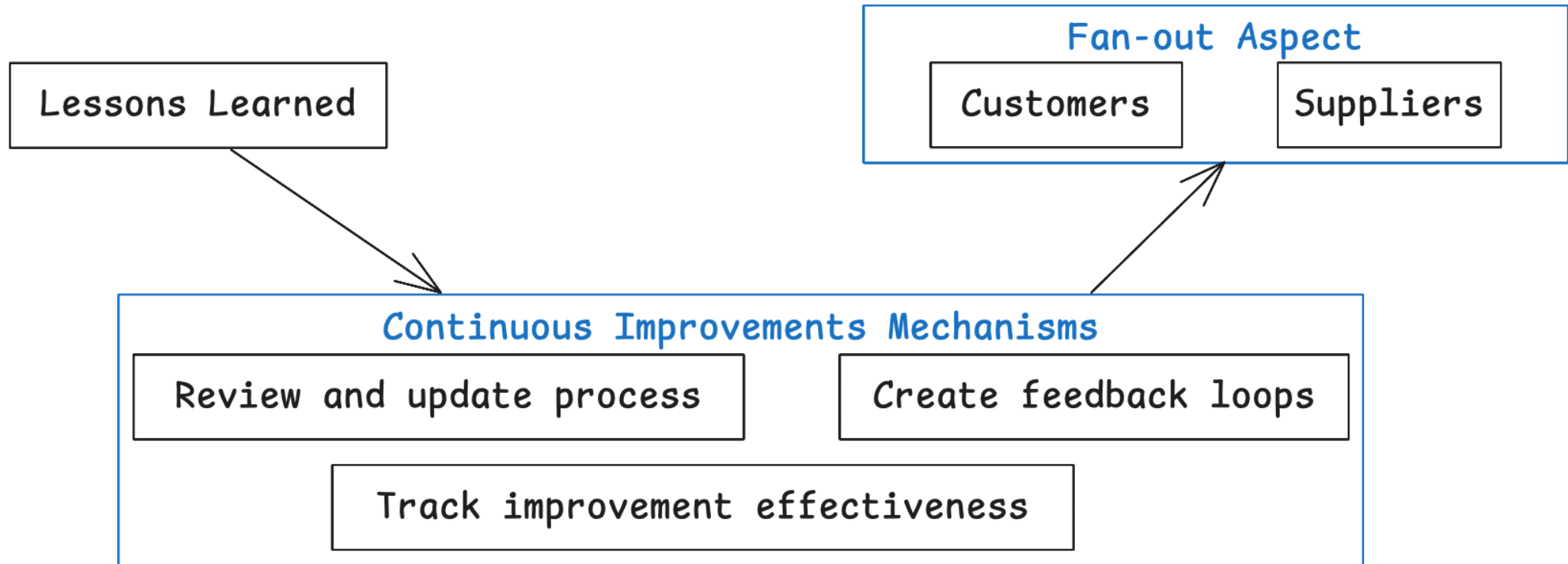
D7: Prevent Recurrence

3. Cross Functional Training



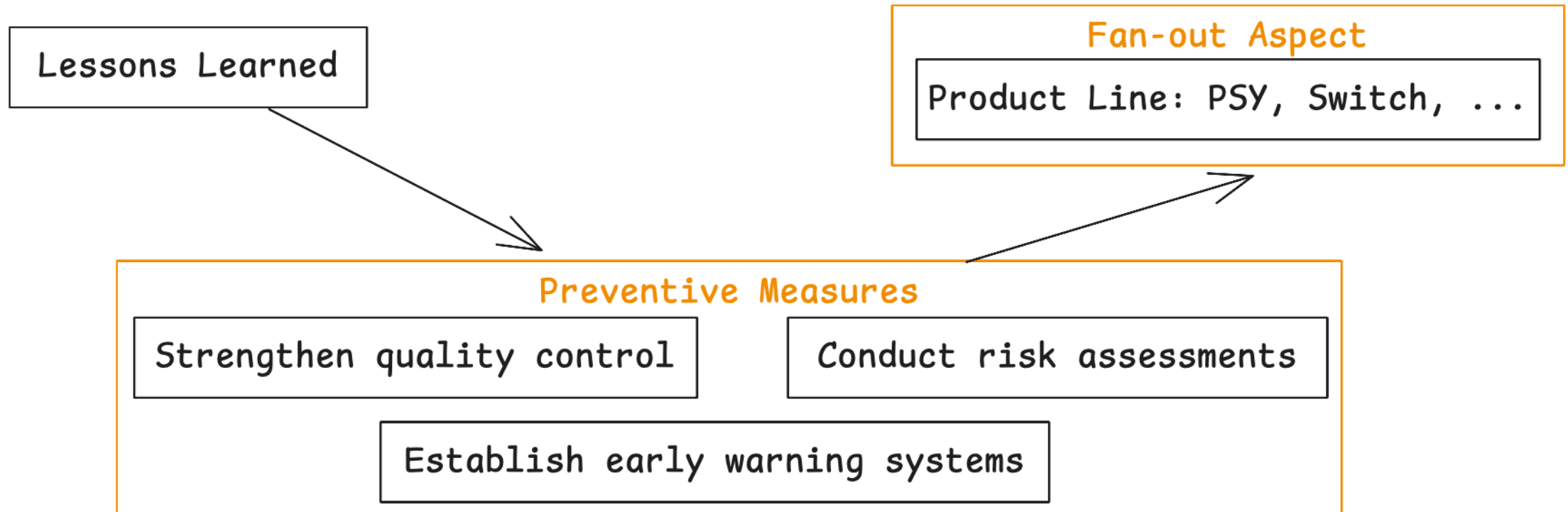
D7: Prevent Recurrence

4. Continuous Improvements Mechanisms



D7: Prevent Recurrence

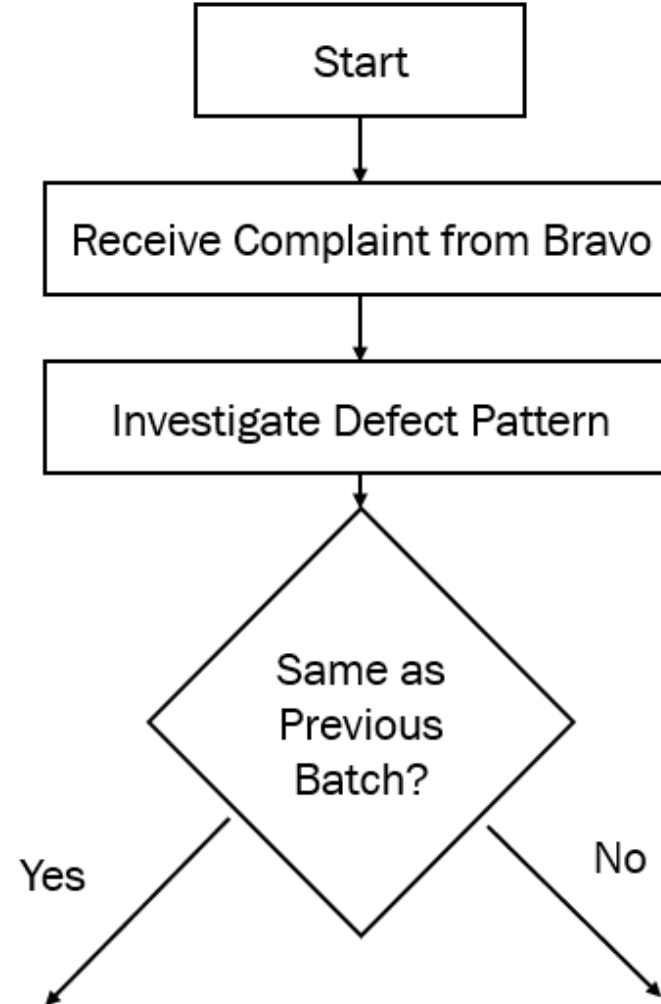
5. Preventive Measures



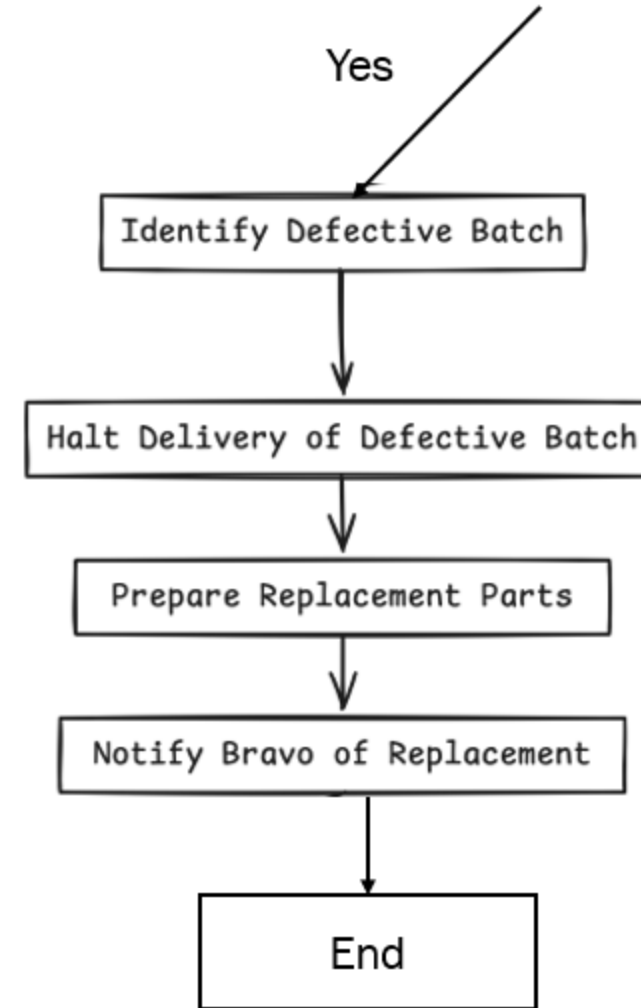
D8: Congratulate the Team

- Acknowledge the contributions of individuals and teams.
- Arrange a presentation to share the problem-solving process, outcome, and lessons learned with boarder organization.
- Reflect overall 8D process and discuss areas for improvement.

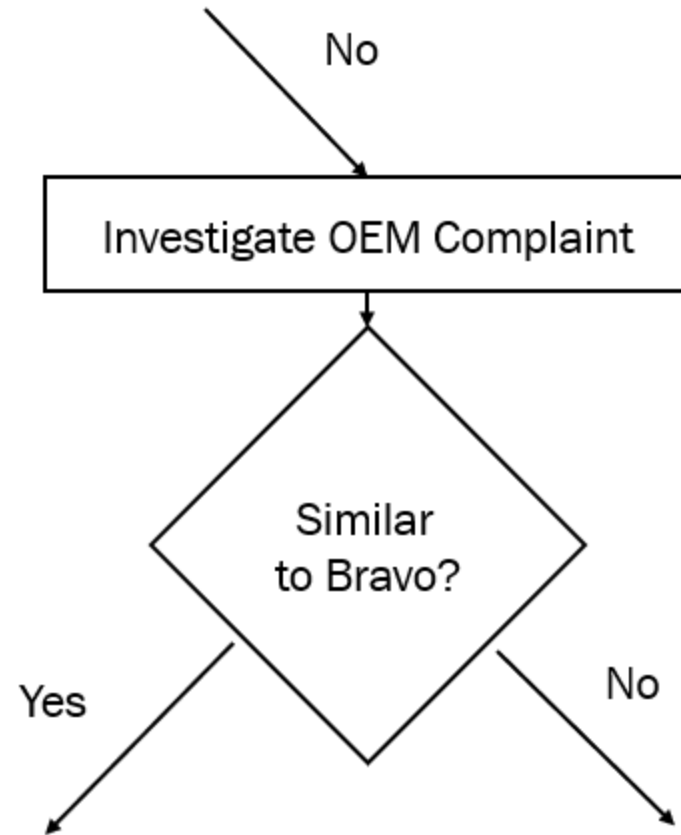
Customer Complaint Handling Flowchart



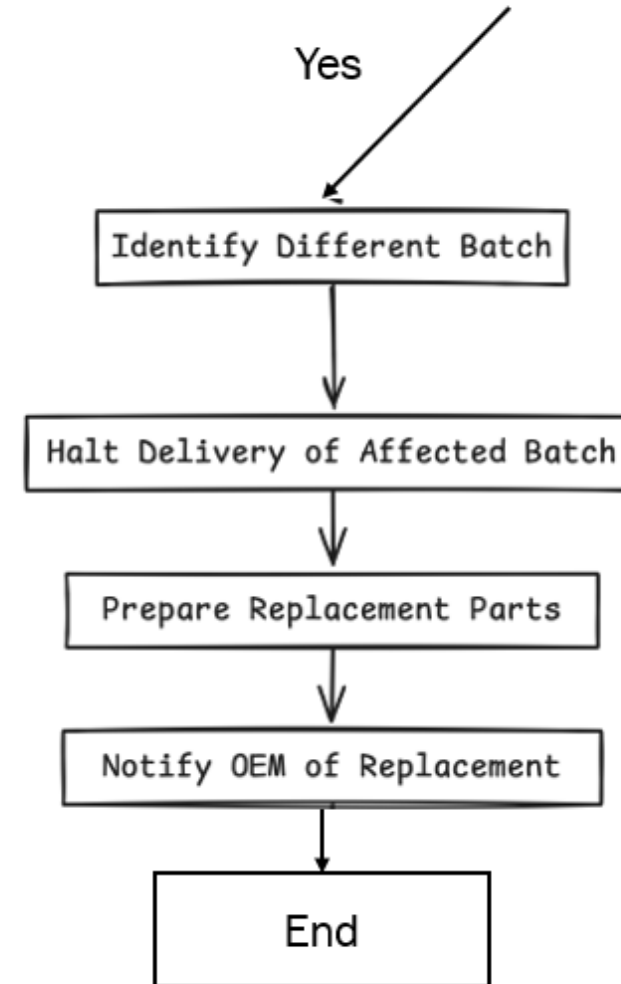
Customer Complaint Handling Flowchart



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